ELECTRICITY IN WAR.

Distinguished Engineers Present Plans for Applying this Power to Our Uses in Time of War.

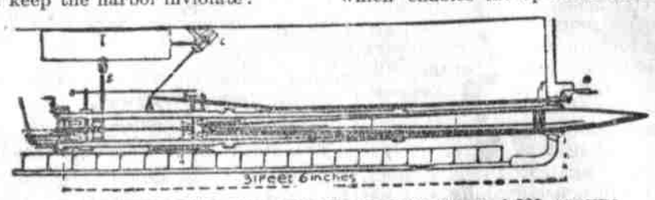
TROLLEY FORTS AND BIG WATER BULLETS.

A Torpedo Propelled by Electricity That Chases a Ship at a Speed of 24 Knots, and Destroys Everything It Hits With Speed and Certainty— The Electric Balloon and Sub-Marine Cable Way.

THOMAS COMMERFORD MARTIN

Describes New and Other Possible Inventions for Making War More Terrible.

The defenses of New York harbor must necessarily be placed in the vicinity of Sandy Hook, as there are guns afloat which could at that distance bombard Brooklyn or Manhattan island, and convert their tall buildings into holes in the ground. It is obviously desirable, should any foreign war arise placing this country on the defensive, to keep the floating enemy at long range, and, while holding him there, assume the offensive in a manner that will either diminish his fleet or cause it to retire. Can electricity do anything by its marvelous flexibility and adaptability to insure the safety of the great city, and keep the harbor inviolate?



ERICSSON SUBMARINE GUN—WEIGHT OF PROJECTILE, 1,525 POUNDS.

It is believed by those who have studied the subject that electricity offers resources of great value for such a moment of national need, and that six of its weapons alone might prove adequate. These six are submarine mines, dynamite guns, dirgible torpedoes, trolley forts, disappearing boats, and navigation balloons. All of these can be readily operated from the Long Island or New Jersey shores, so that, to begin with, the invader would be held off at more than arm's length.

Submarine mines are simply anchored and submerged torpedoes controlled at practically any distance from shore by electrical apparatus, which sends the current through the wire, and fires the fuse or effects a release. The operator on land, guided by various methods, discharges the mine at the right moment; and there are also electrical methods which cause the simultaneous discharge of guns trained upon the same spots as those at which the mines are situated. The shores and waters around Sandy Hook are admirably suited to this system of defense, and it would not be very expensive to provide mines enough to blow sky-high even as large a fleet as that which gathered last year to see the international yacht races.

There is no good reason why submerged forts should not take the place of the mines, or supplement them, and the guns therein be fired electrically from shore, miles away. It has already been demonstrated that an Ericsson submarine gun will fire a projectile no less than 600 feet under water, and hit a vessel 50 feet long, from a depth of 22 feet.

My next item is dynamite guns. The shells from these terrible weapons carry a small electric battery, and thus the explosion of the deadly charge is regulated, although the gunners are quite safe. Hitherto the range of dynamiters has been comparatively limited, but it is certainly capable of increase, with an increase also in the quantity of the charge. It must be remembered, too, that the shell does not have to strike its mark in order to be effective. The explosion is the main thing. Dynamite guns with a seaward range of only five miles at Sandy Hook, firing charges of 600 pounds of explosive in the electrical shells, would be oppressively disagreeable to an invading fleet.

Navigable balloons operated by electric motors are a success, and in the time of emergency would become vastly more so. As far back as 1884, two French army officers showed what could be done in this respect, steering a big balloon around freely, and making 5½ miles in 23 minutes. Such balloons as this could be admirably operated from the Highlands, and could drop explosives or suffocating chemicals at will upon any ship. Recent trials in Austria have shown that it is well-nigh, if not altogether, impossible to train guns up into the air and hit a balloon, even if it be "stationary." Balloons steered around by electric motor can go out boldly to sea, and as freely regain the shore. Half a dozen of them would be worth untold millions, but the very finest could be had for $100,000 apiece, fully equipped.

I come next to dirigible torpedoes, of which the Sims-Edison is probably the best type. It is entirely operated from shore, carrying along in its hull a coil of wire, which unreels as it goes, and through which passes the current which enables the operator on shore to make it dodge like a dexterous football player. Dynamite is stowed away at the business end, and the fuse is also fired by the guiding hand on shore. At Willet's Point, in 1891, one of these torpedoes, loaded with 500 pounds of dynamite, was manipulated at a speed of 20 knots an hour for two miles. The English, in 1892, tried one of them by maneuvering it from the deck of a steamer in motion, when it ran out actually 7,000 feet of cable in a shade over four minutes, and was made to twist and dive like an eel. A batch of these would be ugly customers, no matter how thorough might be the man-of-war's protection of torpedo netting. Only 50 horse-power in electric current is required to propel one of standard size, and if 500 horse-power, or even 1,000 horse-power, of electricity were put behind one, it would rush on its prey several miles off, with a liberal ton or two of dynamite, and with absolute certainty of delivering the goods. The machinery on shore which operated it could operate an endless succession if it were necessary.

Trolley forts are a feature worthy of consideration in coast defense. It is not new to iron-clad a locomotive and car, and run them over a track, but it would be new to adapt the light and simple trolley to a system of movable patrol forts, each covering several miles of coast, and each equipped with as heavy a gun as could be mounted on a big truck of broad gauge. Dynamite shells can be fired from such a trolley fort at any point along 20 miles of coast, the power house being located midway. All the machinery for firing dirigible torpedoes could also be handled comfortably on such a trolley fort. The recoil even of big artillery is easily provided for. If the road were shorter very weighty pieces of ordnance could be moved thus up and down a mile or two of earthworks or masonry. There are electric motors on the Baltimore & Ohio railroad today hauling loads of 1,200 to 1,500 tons at several miles an hour, and they could certainly tow around a fort and artillery weighing less than a quarter of that. The same trolley road would be available at all times for moving troops and transporting supplies, and in times of peace for lifeboat service. One of the best defenses for New York is a military trolley road on each shore at Sandy Hook. The track can be depressed and the wire put low at the side. Laying and repair are both remarkably easy, and some electric locomotives even now are built as flat as turtles.

A good many disappearing electric boats have been constructed, and there is no doubt whatever that New York harbor can have the benefit of some very good ones when the time arrives. A French boat of this class has remained under water with two men eight hours at a depth of 33 feet. The American Baker boat of 75 tons has remained sealed up, on the surface and below it 2¾ hours, and travels on an even keel far under water, turning readily right or left. The only trouble in this work is the difficulty of seeing very far ahead below the water, but these boats would be able to do considerable damage and often escape unseen. The use of storage batteries enables them to travel silently on the surface until near their mark, and recent experience has shown that even an ordinary torpedo boat can get over the danger line before her big opponent is aware of it.

THOMAS COMMERFORD MARTIN.

PARK BENJAMIN

Says It Would Take Two Years to Get Ready for War.

There is a popular notion that we possess in "electricity" a mysterious power somehow able to destroy fleets and armies, and with this is coupled a complacent faith that in event of war there will appear a new Archimedes, who will in an instant discover and give us an electric something which will quickly annihilate the invader. It is an excellent thing to believe in ourselves (and the last war gives us good reason for doing so), but there is a big difference between relying on what we have done and upon what we suppose we can do, especially when there is more romance than reality in the supposition. True, the workings of electricity have now come home to us more than ever before, yet at the same time never have we been so surfeited with tales of the "wonders" of it. Ordinarily this dwelling on mysteries and marvels is in a measure harmless enough, even stimulating, but in the face of the present anxieties it operates to keep people in a fool's paradise with respect to a potent factor in the national safeguards which is distinctly injurious.

It is time to put wonders, present and prospective, out of sight, and to deal with facts. It is necessary to understand that we cannot make artificial thunderbolts, that we cannot shake ships to pieces by induced vibration in the cosmic ether, and that we cannot send disintegrating currents to them or even drag them upon rocks or shoals by the attraction of powerful electromagnets. In short, we cannot do with electricity anything that is wonderful because occult or mysterious at all; nor anything, indeed, of which the laws are not just as certain and familiar to the people whose bread and butter depends on their knowing them as are the rules for making bread or weighing butter to the other people who keep bake shops or groceries.

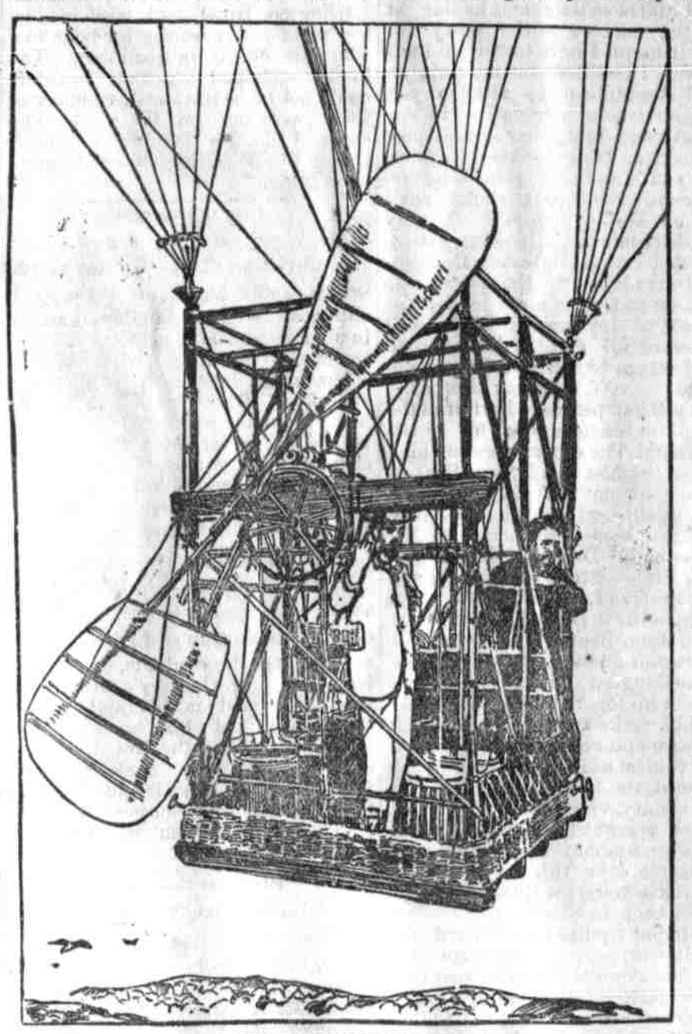
If electricity can help us to protect our seaboard cities, we want to know how it is to do so, and what we have to do in order to fully utilize it, and this without any muddling of it with "wizards" or "wonders."

Electricity—whatever it may be—is of no use except through its operation, and the machines which it drives or controls are what we depend upon.

These have to be designed, built and tested, and kept ready, just like all other structures that men make. That requires time. They cannot be suggested one day and used the next. It has taken 20 years to bring the telephone to its present imperfect state, and 80 years to develop the still more imperfect electric light, and one of the most important of all the military uses of electricity (the firing of explosives) has been known and practiced for a century and a half.

If, now, a foreign fleet should appear off a harbor, say New York, what are the known applications of electricity which we can use? That is the question which I propose briefly here to answer. We have some powerful guns which shoot in nearly straight lines, over long distances, and others which throw projectiles over longer distances high into the air, and so drop them upon the enemy. But it is of no use to throw things at a warship unless we know the distance of the vessel from us, and in what direction she is moving, or, in brief, where she is; otherwise we cannot train and elevate the guns so as to make the shot and shell go to their target. Hence, as soon as the invading fleet appears on the horizon, the observers on the shores will direct upon it their electric range and position finders, and the position finders will show the location of the vessel upon a chart representing the harbor and outlying waters, and will indicate their direction and speed of movement. Then the mortars can be accurately placed and will begin to toss skyward their hail of shells. As the ships draw near (their bearings having been got), the range finders will measure their distance every few seconds, and the high-power guns will open fire with their armor-piercing steel shells. If the great armor-clads withstand this unscathed, and come still nearer, the curious coughs of the dynamite guns will begin. The huge tubes will be trained by instantly working electric motors; the odd cigar-shaped projectiles will soar slowly into the air, carrying certain destruction to any vessel which one of them may hit, or, if failing to strike, hurling aloft great geysers of foam. There is no delay in this firing; not only will the electric motors quickly move the guns responsive to a touch, but the propelling charges of the powder guns will be ignited by the pressing of the button controlling the electric primers, and the electric fuses in the shells filled with nitro-gelatine or gun cotton will detonate them the instant the ship is struck or the moment after submersion.

But perhaps the attacking vessels are pouring in a return fire, silencing the batteries, so that the long line of ships begins to enter the channel. Now, a dozen or more of lean, long-pointed crafts moving under the water draw away from the shore. No human being is on them. Some are driven by electric engines, supplied with current by wires leading to dynamos on the land; others are propelled by carbonic acid gas, and are only steered by electricity through cables which they lay behind them as they move. They will run at high speed for miles. Any one of them touching a ship infallibly sinks her, for the head of each is filled with dynamite.



THE ELECTRIC BALLOON.

Or perhaps a column of black smoke (which seems to rise out of the water itself) close to the land suddenly disappears, and the sea is scarcely troubled by the swift progress beneath it of the Holland submarine boat, 80 feet in length, a warship in herself, driven by electric motors, and rushing unseen to the attack, delivering torpedo after torpedo, or finally crashing her ram into the enemy's unguarded ribs, far below the water line.

Meanwhile the position finders on the harbor forts are showing simultaneously to the whole cordon of fortifications the exact location of the ships upon which the fire of all the batteries is now concentrated. If smoke cuts off the view from one battery, another may have clear sight, and the telegraph conveys knowledge of the exact position of the ships from those who can see to those who cannot.

As the vessels penetrate the outer harbor new difficulties confront them. The whole roadstead is planted with submarine mines, placed at exactly designated places. A system of electric wires connects these with the governing switch-board and electric batteries in the forts. They are so placed that ships going through the channels must pass over them.

When the position finder shows that a vessel is finally in the toils, the observer in some far-distant bomb-proof touches a key, and the hidden volcano is set loose. Nor does the blackness of night serve as a shield. The powerful beams of a dozen electric searchlights may be converged upon the vessel, so that every mast and every rope stands out like silver.

Such is the picture of what electricity, through its military applications, could do to help us. It involves no "wonder," but it is none the less appalling—this array of electrically controlled guns and torpedoes. It is a brave commander who will dare try the shells which come in a straight line, and the shells which run around under the water, and the shells which explode from the bottom to blow him into the air, and the shells which fall down from the sky to blow him to the bottom again—all of them at once perhaps. If, in fact, we do possess all of these defenses, we may perhaps hear with equanimity of the coming of the great sea monsters. But if we do not—their majesties' admirals need not be Farraguts; and as for ourselves, it will not be philosophical calmness which we will need, but Spartan fortitude. As matters now stand, the sooner we cultivate the latter quality the better. The fact is, we have not got them.

True, we have had the intention of working all these terrible and formidable engines some day with the aid of electricity. But intentions will not stop iron-clads, nor will even such inadequate progress as we have made toward realizing them be of much use, even if its results were all immediately available. The point is not whether we can prepare in some period of time, but whether we are ready now.

We may assume that our harbors have been surveyed, that the places for sunken torpedoes and position finders and switch boxes have been determined, that we have selected the kinds of torpedoes to be used, and have systematized the handling of them down to the last tactical detail; so also we may know that we have factories which can build searchlights—none better—and workshops where dynamite guns, and electric motors, and fish torpedoes, and submarine boats, and position finders, and dynamos can be constructed. Likewise, it is true that we have men skilled in using every type of electric appliances eager and ready to handle these things. But all this does not alter the fact that we have made neither the things themselves to any adequate extent, nor have drilled and educated the large number of men required to use them in the places and for the purposes for which they are intended.

The mines are not planted in our harbors, nor are the torpedoes in any sufficient numbers yet constructed. To put them in position, to lay and adjust their complicated network of cables is a long and difficult proceeding. We have no dozen of fish torpedoes to let slip all at once; the submarine boat is still unfinished; the electric nerves are in but very few of our war ships; the turning of turrets by electric motors is still a matter of isolated experiment; and of the position finders (those most ingenious inventions of Lieut. Fiske, of the navy, who also devised the range finder, and of Lieut. Lewis, of the army)—vitally necessary as they are, so necessary that the practical efficiency of all our guns depends upon them, and which really constitute the only new application of electricity in the whole category—we have but three, all in the harbor of New York.

So not only can electricity do no wonders for us, but we cannot at the present time avail ourselves of the plain and obvious application of it to military purposes which we know.

A part of the money which congress proposes to expend in fortifying the seacoast should be devoted to the placing of these electrical devices in practical use at once. A reserve battalion of electricians should be organized and drilled in the handling of them, and arrangements should be made with the great electrical workshops of the country which will insure not only a present, but a continuing, supply of every needful appliance. Finally, the red-tape tangles at Washington should be ruthlessly cut, as a step to inducing inventors to work vigorously for the betterment of the existing instrumentalities, and not toward finding new ones.

PARK BENJAMIN.

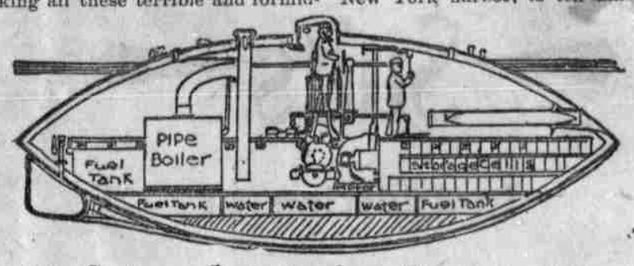
S. DANA GREENE,

Of the General Electric, Tells of Some Arrangements That Have Been Made.

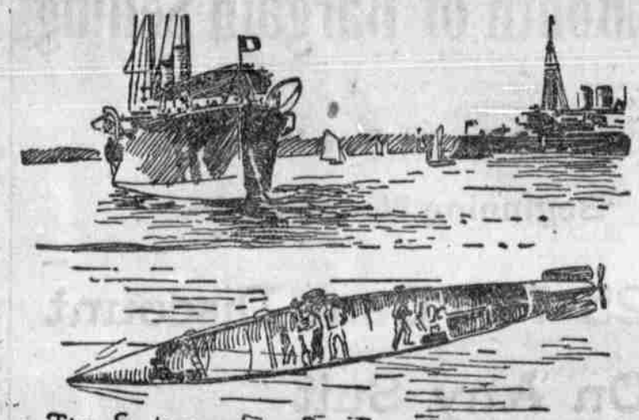
The bays and harbor of New York are peculiarly adapted for defense by submarine mines and controlled torpedoes, operated by electricity from shore. The ten fathom curve (60 feet) of soundings runs about five statute, or land, miles from the Rockaway Beach shore. The air line distance from this shore line to the battery is about 12 miles. The entrance to the Gedney channel, through which all heavy draught vessels must pass in entering New York harbor, is ten miles from the narrows, in an air line, and 15¾ miles by channel, while the narrows are, in turn, seven and one-half miles from the battery. The water spaces within the ten-fathom line, off Rockaway Beach and Coney Island, and comprising the channels of entry into the harbor, could be so planted by moving torpedoes, all controlled from shore, as to make it hazardous for an enemy's vessel to enter them; so that a fleet could not, in all probability, approach within 17 miles of the battery, or 15 miles of the business center of Brooklyn, for bombardment purposes, without serious risk of destruction. At these distances New York could not be reached at all, and only the outlying districts of Brooklyn could be seriously damaged, by even the heaviest ordnance afloat.

The army engineers have prepared elaborate plans for the location of submarine mines in all of the approaches and channels in the bays and harbor. They consist of buoyant steel cases, containing 400 or 500 pounds of dynamite or other high explosive, and attached to heavy "Mushroom" anchors by a length of cable, so that they will stand in the channel 15 or 20 feet below the water's surface. Each mine is connected by an electric cable to an operating station on shore, for example, at Sandy Hook, the Dry Romer Shoal, New Drop Beach, Norton's Point, (west end of Cony Island,) Forts Wadsworth and Hamilton, at the Narrows, etc. At the operating station are suitable batteries and keyboards so arranged that the operator can explode any mine or group of mines at will. There is also an accurate chart covering the area controlled by the station, and indicating the exact location of each mine. By means of what is known as a range and position finder, the movements of any vessel within the area are followed from the station with telescopes, and her position is shown on the chart. Whenever this position coincides with the location of a mine, the ship is over that mine, and if the latter is exploded the ship will be struck and destroyed or disabled. This system of mines, however, has its limitations, for the weather must be clear, and it must be light, for the observer to see and follow the vessel with the telescope. For this reason some mines are so arranged that they will explode whenever struck by an object, as well as when fired electrically from shore. Such mines, however, are dangerous to friend and foe alike, and cannot be generally employed, if the channels are to be used at all by our own vessels. It is generally understood that the army has mines, cables, and operating station equipment manufactured and ready for immediate installation in New York bays and harbor in case of necessity.

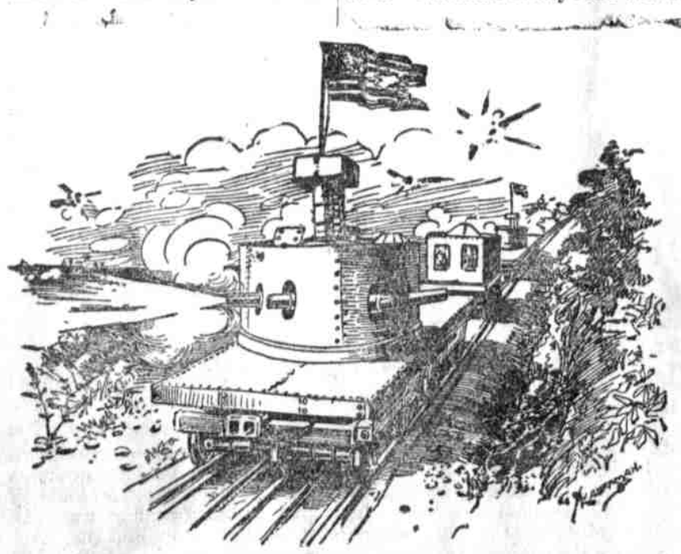
S. DANA GREENE.



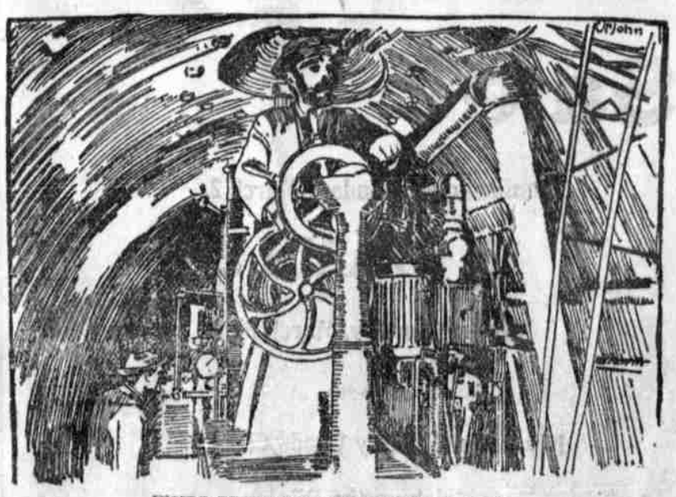
The Baker Submarine Electrical Boat.



The Submarine Boat "Gymnote" at Work.



THE TROLLEY FORT IN OPERATION.



INSIDE THE SUBMARINE ELECTRIC BOAT.